

1 ELECTRICAL CONNECTOR (RECEPTACLE) WITH EASILY REMOVABLE BOTTOM
23 *Background of the Invention*

4 The present invention relates to a novel electrical
5 connector that is attached to a printed circuit board by
6 soldering, in which the connector is a receptacle usually, but
7 not necessarily, arranged in an array, such as, a single row,
8 dual row, triple row, dual-in-line, pin grid array or other
9 configuration of grid. The receptacle has placed or formed
10 within it a spring contact for mechanically gripping another
11 connector which will be inserted into it. One end of the
12 connector is sealed by a removable material which is resistant
13 to the heat of the soldering and at the same time protects the
spring contact from contamination with flux and liquid solder.

14 *Field of the Invention*

15 The present invention relates to the field of electrical
16 connectors arranged in arrays for soldering to a printed circuit
17 board. Printed circuit boards with arranged arrays of contact
18 receiving orifices are the *sine qua non* of modern electronics
19 including but not limited to computers of all types and
descriptions, telecommunications equipment of all kinds,
20 displays, television, radio, radar, sonar, toys for tots and so
21 on. The list of the items which utilize this precise electrical
22 interconnect structure is virtually endless. The universal
23 problem with these interconnect devices is how to solder the
24 connector to the circuit board without damaging the spring
25 contact within the connector. Many solutions have been tried.
Some worked effectively enough to protect the spring connector

1 but in so doing the opening at one end of the connector is
2 itself sufficiently plugged as to make the connector useless or
3 difficult to use for its intended purpose. The most common of
4 those solutions was the use of a metallic "knock-out" bottom
5 which required a separate tool to be inserted into each
6 receptacle to remove the metal bottom forcibly, assuming of
7 course that the receptacle bottom had not been soldered so well
8 that it could not be dislodged at all or without breaking the
9 connector or circuit board. These solutions are shown in data
10 sheets of Amp, Mill-Max, and Cambion, copies of which are
11 attached to this application as Information Disclosure Statement
12 by Applicant.

13 *Description of the Prior Art*

14 The closest prior art known to the applicant is shown by
15 the attached Data Sheets. None of these teachings show either
16 the physical structure or the function taught by the present
17 invention. They show the use of a metal cover over one end of
18 the receptacle which requires a metal tool to dislodge it, if it
19 hasn't been soldered to the receptacle during the soldering
20 process. If that happens it is difficult or even impossible to
remove the cover.

21 *Summary of the Invention*

22 The present invention teaches, in a number of embodiments,
23 a novel structure and function of an array of connectors
24 fastened to a planar insulator, usually formed of a high
25 temperature thermoplastic. The planar insulator has a pattern
of substantially cylindrical openings formed therein into which

1 is inserted a machined copper alloy sleeve which is plated with
2 tin or tin-lead alloy. The sleeve itself is a hollow
3 substantially cylindrical tube with a multi-finger spring
4 contact inserted near one (usually called the upper end). The
5 spring contact itself is plated with gold, tin, tin-lead or
6 other malleable electrically conductive material. At the far
7 end of the cylindrical tube is fixed a plug of "kraft paper" to
8 function as a barrier, made from substantially pure wood pulp
9 with no fillers. The cylindrical tube of the sleeve grips the
10 kraft paper barrier sufficiently for it to remain in place
11 during the processing cycle when the copper alloy sleeve is
12 soldered to the circuit board. The "kraft paper" is stable and
13 unaffected by the temperature to which the solder is heated to
14 become fluid and can be easily removed by the insertion of a
15 connector lead into the sleeve.

16 *Brief Description of the Drawings*

17 Figures 1 shows in perspective a three layer circuit board
18 assembly showing one embodiment of the invention

19 Figures 2 is a sectional view taken along the line 2-2
20 shown in Figure 1 and shows the inter-connection pin in the
21 sleeve and being gripped by the contact spring before pushing
out the kraft paper barrier.

22 *Description of the Preferred Embodiment*

23 Figure 1 is perspective view of a first embodiment of the
24 present invention showing by the number 10, by way of example
25 and not limitation, a three-layer circuit board assembly. The
circuit boards are shown as parts 12, 112, 212 in which like

4
1 parts have like numbers preceded by the numeral 1 or 2. Each
2 circuit board has an array of plated through orifices 14, 114,
3 respectively. Interconnecting the circuit boards are
214 sockets 80, 180 with interconnection pins 50, 150.

4
5 Each circuit board has an upper and lower surface 13, 15,
6 113, 115, 213, 215 respectively as shown in Figure 1. The
7 sockets 80, 180 have through channels 82, 182 into which are
inserted interconnection pins 50, 150.

8
9 Looking at the detail shown in Figure 2 for the socket and
interconnection pin portion of the invention is the socket
10 insulator having a socket sleeve 190 inserted there through. A
11 multi-finger spring contact 62, 162 formed from spring temper
12 copper alloy which is inserted into the upper end of the socket
13 sleeve. The lower end (as shown in the Figure) of the socket
14 sleeve has in this embodiment a smaller diameter extension 192
15 for soldering to the lowest circuit board 212.

16
17 The lower end of socket sleeve, more particularly the far
end of the sleeve (opposite the end having the spring contact)
18 has an edge formed by the taper of (normally) vertical outer
19 side 170 which forms a sharp edge 174 at its near intersection
20 with inner diameter surface 172 of the sleeve. This sharp edge
21 surface of the sleeve captures the kraft paper plug 250 which
22 forms the protective barrier for the sleeve during soldering.
23 The soft, easily removable barrier 250 protects the inner sleeve
24 and spring contact from flux vapor and molten solder during the
25 operations which form the solder joints 220, 230 shown in Figure
2. When the interconnection pin 150 is inserted into the sleeve